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THE
NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI OCTOBER, 1900 No. 10

THE LESSONS OF GALVESTON

By W J McGEE

Formerly Geologist in Charge Coastal Plain Division, U. S. Geological Survey

The darkest horror of American history has fallen on our southern coast; a city comparable in population and wealth with Ephesus and Sodom of old, with Herculaneum and Pompeii of appalling memory, and with earthquake-wrecked Lisbon of later centuries, is blotted out in a night. Thirty-eight thousand people, the life and soul of a progressive and thriving city, are overwhelmed and doubly decimated by wind and wave in the darkness; literal thousands are crushed in their own falling houses or drowned in the raging waters; every survivor is made homeless, and most of them are utterly impoverished. The morning's sun rises on a scene of suffering and devastation hardly paralleled in the history of the world—a scene which has been, and will be again and again, described by tongue and pen, but never in more than a fraction or suggestion of the ghastly details. Out of the awful chaos spring the twin progeny of catastrophe, begotten of the best and the worst of humanity—Heroism, clad gloriously in helpfulness and self-abnegation, and Ghoulism, shrouded vilely in cowardice and unholy greed. For many hours the disaster is secluded by the very extent of its wreckage, but the next day brings sympathy and substantial aid in a measure unequaled in the annals of nations: the great State of Texas is stirred into noble activity; hard-pressed Federal officials turn promptly from grave political and international problems toward the stricken city on the coast, while literal millions of fellow-citizens spring to seek means of contributing to the alleviation of the lot of the sufferers. Viewed as a physical phenomenon, the destruction of Galveston was a moving spectacle; viewed in its effect on human sympathy, it was sublime beyond all precedent.

Several lessons of the Galveston horror are well worth reading and pondering:

The first lesson is the old, old one of experience summed in parable, which bans the building of a house on sand. Galveston was founded on a sand bank—a mere wave-built cay or key—made by the waves of average storms during a few centuries. Up to its highest point (less than a dozen feet above low tide) the earth of the island comprised absolutely nothing but wave-cast sand and silt, and to a depth of at least half a mile in vertical measure there is no solid rock; the strata are loose sands and silts and mud beds, nowhere firm enough to afford a sure foundation. Geologically the deposits are those of the Pleistocene Columbia formation to a depth of several hundred feet, and these are underlain by lithologically similar deposits of several Tertiary formations. The successive formations from the Columbia downward are mechanical deposits; they are not cemented with calcareous or silicious substances, like some of the formations of the eastern Gulf coast, nor are they bound together by coralline masses like some of the West India littorals; they include little material save water-logged muds and silts, semi-solidified by pressure at depths, but nowhere lithified into firm ledges. And what is true of Galveston is measurably true of the entire western Gulf coast from Vera Cruz to the Mississippi passes; no worse coast-stretch for foundations exits in the world, and none other so bad is of anything like equal extent.

The second lesson is but the first raised from the plane of experience alone to that of recognition of natural agencies: The sand bank on which Galveston was built is something more than a simple heap of silicious grains and dust; it is a record of past wave-work which might well have deterred the founders of the city. The most conspicuous work of waves and wind-driven sea-currents is the building of bars of sand or gravel gathered from neighboring shore-stretches or washed up from shallow bottoms; only less conspicuous is the work of these agents in carving sea-cliffs. Both modes of work are preëminently characteristic; there is not a mile of our eastern and southern coasts, from St Croix River bounding Maine to the Rio Grande beyond Texas, without one or the other of these products of sea-work. On some coast-stretches, like that of southern New Jersey, the bars and sea-cliffs alternate, the one stretching across the mouths of valleys embouching toward the sea, the other truncating the divides between the valleys; along higher and rockier shores, like those of

New England, the sea-cliffs predominate; but along the flatter coasts, like most of those along the Gulf, the bars—the keys of the vernacular—predominate, and are commonly separated from the mainland by sounds; so that everywhere the character of the shore is determined primarily by its height above tide, secondarily by the work of waves and sea-currents in building bars and carving cliffs. Now the important point in connection with the bar or key is the fact that it is built by waves aided by the currents, so that its height and breadth afford a fair measure of local wave-work—not of the idle ripples of the calms, not even of the breakers of lesser storms, nor yet of the great hurricanes happening by at intervals of centuries, but of the greater storms of current decades. So the crest of the key marks the reach of the great but not phenomenal tempest, and its seaward slope gives some indication of the frequency of such storms, the steeper slope attesting a more frequent wave-work; while the effect of the century-rare typhoon is rather to destroy than to build symmetric keys, such as those skirting our Gulf coast and some stretches of the Atlantic shore thence northward. Other factors, including customary tides and prevailing winds, affect this sea-work; but they are subordinate. Thus, the elongated key on which the city of Galveston stood was but a natural storm-record; and it was merely by chance of weather history that she so long survived.

It is the business of the engineer and architect to look to foundations, and to avoid the traditional house on the sand; but it is the duty of the nature student to interpret natural records and guard against the building of houses within reach of storm waves—still more against building on the storm-records themselves. Fortunately the students of nature are now legion; the geologists and physical geographers from Harvard and Stanford, Columbia and Cornell, Yale and Chicago, and a score of other institutions of modern learning are diffusing actual knowledge with unprecedented rapidity; even the more progressive public schools, like those of Washington during the last lustrum, are substituting real knowledge for the husks of learning, and inculcating ideas of nature-work which will be of inestimable value in guiding the location of cities and bridges, railways and moles, with proper regard to natural conditions—and it is not too much to hope that every citizen of this enlightened land may soon be able to interpret such simple and self-evident nature-products as storm-built bars and keys, and that if he sees fit to build a wharf or erect a warehouse on a storm-record he will do so with his eyes open,

with clear knowledge of the risks involved, and with due precautions for the safety of the helpless and dependent in his own family and others.

There is a third lesson, less simple than the first and second, but far too important to be neglected: it is the lesson of coast subsidence, already learned by Holland and Helgoland, and now forcing itself on Louisiana and Texas as well as New Jersey. The student who scans the shores of Atlantic and Gulf, either on the ground or on the admirable maps of the Coast and Geodetic Survey and the Hydrographic Office of our Navy, soon perceives that the relations between wave-built bars and wave-cut sea-cliffs vary from coast-stretch to coast-stretch. On the New Jersey coast the bars are beaten well back to or beyond the line of the sea-cliffs, so that the ponds or sounds behind the bars are relatively short and discontinuous; along the Florida coasts the keys stand farther out to sea, and are separated from the mainland by great elongated sounds often affording navigable waterways; while about the northern shores of the Gulf the relations of the keys to sounds are more variable. Closer study serves to interpret these variable relations: from Florida westward to Mobile Bay the keys are nearly continuous and the sounds long and narrow; thence westward to Lake Borgne the typical keys are lost, though their lines continue in a series of islands—Ship Island, Horn Island, Cat Island, etc.—separated from the mainland by the broad Mississippi Sound; still further westward a new series of keys, erratic in form and trend, appears in the Chandeleur Islands, and beyond the delta there is a corresponding (and correspondingly erratic) series of low keys stretching westward nearly or quite to Atchafalaya Bay. Now, the mainland shore of Mississippi Sound is marked by a series of small and narrow keys and sounds, evidently in process of growth, but much less advanced than those east of Mobile Bay; and these are among the evidences that along this stretch of shore the Gulf has encroached on the land to such an extent as to leave the original keys 20 to 40 miles behind. Similarly the Chandeleur keys and the corresponding series west of the delta are small and new and obviously connected with the delta building. But west of Atchafalaya Bay the coast is characterized by the absence of keys and sounds, save of the infantile sort, like those of the inland shore of Mississippi Sound; so that this shore seems incongruous with the rest, until the student discovers the long line of completely submerged keys—Sabine Bank, Trinity Shoal, Ship Shoal, etc.—in a position precisely corre-

sponding to the islands south of Mississippi Sound and forming a direct submarine connection (save as cut off by the delta) between these islands of the eastern Gulf and the well developed keys of the southern Texas shore. The position of these banks, like that of the Horn Island and its fellows, is such as to demonstrate that the waters have invaded the mainland, and that west of the delta the encroachment has been sufficient not merely to push back the shoreline 50 to 100 miles but to completely submerge the ancient keys. The most striking feature of these drowned and half-drowned keys is their symmetric arrangement; except for the interruption by the delta (with its new and lesser sand banks), the great bars form a sweeping curve regular as the beach line of a land-locked bay, and hence afford a rough measure of the outbuilding of the delta as well as of the invasion of the Gulf on its flanks. Hardly less striking than the symmetry of the series is the closeness of continuity between keys and banks; and it is a significant fact that Galveston Island is the northeastern terminus of the west-coast system of keys, the last stretch of these sand banks still rising above the level of tide.

It is the business of the geologist to detect and weigh the evidences of subsidence or elevation of coasts and to estimate the rates of movement for the guidance of local residents and investors; and it behooves such citizens to avail themselves of the scientific researches. The observations on the rise and fall of various coasts are impressive: Holland derives its name from its subsidence, coupled with the building of dikes for the protection of the land; the Island of Batavia, inhabited in the days of Tacitus, is drowned; Zuyder Zee was formed by an invasion of the sea about the end of the 13th century, and the Netherland polders (or dike-protected lands) are maintained only by artificial embankments which have been raised from generation to generation until now cultivated fields lie 7 to 10 meters below tide level. The measure of the rate of subsidence of the Holland coast ranges from .09 to .75 meter per century; since 1732 the mean has been .26 meter, or nearly a foot, per century. The subsidence of the New Jersey coast was estimated at two feet per century by State Geologist Cook; it has continued so long that fresh-water cedar swamps have been submerged and the forests imbedded in saline mucks, whence it is a profitable business to mine the logs for lumber; and in consequence of the current sinking the Atlantic is encroaching and swallowing or destroying estates and homes to the value of many thousand dollars annually. The subsidence

of the Gulf coast is less confidently known; but the geologic indications are that it is (at least between Mobile Bay and Galveston Harbor) nearly as rapid as on the New Jersey coast, and more rapid than on the Netherland coast, at least since the building of the dikes; so that the rate cannot justly be estimated at less than a foot per century. Naturally this rapid subsidence has resulted in other catastrophes it were folly to forget: Witness the swallowing of L'Isle Derniére, a health and pleasure resort of New Orleans, with most of its transient population—"the wealth and beauty of the Creole parishes"—just 44 years before Galveston; witness, too, the record of personal observation on the Louisiana coast by the brilliant word-painter Lafcadio Hearn: "The sea is devouring the land. Many and many a mile of ground has yielded to the tireless charging of Ocean's cavalry. Far out you can see through a good glass the porpoises at play where of old the sugar cane shook out its million banners, and shark fins now seam deep water above a site where pigeons used to coo. . . . Grand Terre is going; the sea mines her fort, and will before many years carry the ramparts by storm. Grand Isle is going, slowly but surely; the Gulf has eaten three miles into her meadowed land. Last Island has gone!" Witness, also, Engineer Corthell, the successor of Eads in some of the most remarkable engineering enterprises of the century (in this Magazine, volume VIII, 1897, page 352): "On Belize Bayou . . . stands an old Spanish magazine, built over 200 years ago. At the time of building the jetties at the mouth of the South Pass [1877] this magazine was . . . standing perfectly level, but with the surface of the water stretching across the arch which crowned the entrance door, the sill of which must have been at least 10 feet below the water. . . . Nineteen years later a part of the structure had been removed, but enough of the roof and arches remained to show that the subsidence had continued steadily . . . at about the same rate as during the preceding 200 years. It may be stated that this rate . . . is . . . about one-half of one-tenth of a foot per annum." And let it not be forgotten that of all localities on the Gulf coast Galveston is most exposed; it is the last of the great natural embankments of the west coast remaining unsubmerged, and hence is open to a wider range of gales than any other; it is the point of contact between opposing forces, the land-subsidence on the one hand and wave-building on the other hand, just as was Sabine Bank in its day—but, like that bank, it is bound to be overwhelmed by

one of the few great forces of nature to which human ingenuity and strength must bow.*

These physical lessons are hard—but they are needful.

There is a fourth lesson, which is human; and it is soft and pleasant and promising as the physicial lessons are cruel and gloomy. When the stricken city cried out in anguish, her appeal was met as was no other appeal in history; within a few hours fifty million hearts were touched, and five million fellow-citizens either sent, or sought for means of sending, sympathy enriched by substance. Evidences of the perfect solidarity of a nation united by the enduring bonds of liberty and equality were not wanting before; but it remained for the city of Galveston, the State of Texas, and the first Republic of America to produce the world's brightest example of charity growing out of the community of citizenship. Nor was the wave of sympathy broken at our shores; within a few hours more, messages from the leading nations of the earth proved that the appeal had echoed around the globe, and demonstrated the solidarity of nations and the unity of all mankind in a manner unprecedented in history. Galveston taught the costly but profitable lesson that the city no longer lives unto itself, like Memphis and Athens and Rome of old, but forms an integral part of a nation; that its successes and failures, and the consequences of its wisdom or folly, fall not alone on its own citizens but are shared by millions of men; and that, just as every city is entitled to appeal for sympathy, so it is morally bound to guard against disasters which wring the heart of a nation.

The makers of Galveston erred in building their houses on the sands, in planting their city within reach of the waves, in domiciling their helpless ones on a sinking coast; they have been forgiven their error, more fully and freely than ever were city-makers before; but it behooves them to remember, as they turn toward the future, that charity should not be strained, and that their fellow-citizens have the right to be spared the shock of the inevitable disaster which would follow rebuilding on their devastated sand-bank.

* The subsidence of our coasts has been treated more fully elsewhere. Cf. "The Gulf of Mexico as a Measure of Isostasy" (American Journal of Science, vol. xliv, 1892, pp. 177–192); "Encroachments of the Sea" (Forum for June, 1890, pp. 437–449); and "The Lafayette Formation" (Twelfth Ann. Rept. U. S. Geol. Survey, pp. 347–521).

THE WEST INDIAN HURRICANE OF SEPTEMBER 1–12, 1900

By E. B. GARRIOTT,

Professor of Meteorology, U. S. Weather Bureau

The United States Weather Bureau at Washington will shortly issue a bulletin on West Indian hurricanes, which contains a chronological record of more than four hundred tropical storms. The record begins with a storm which visited the island of Cuba May 19–21, 1494, and describes many of the great hurricanes which have swept the Antilles and the Atlantic and Gulf coasts of North America during the last two hundred years. It is a recital of appalling disasters on land and sea, and presents as its crowning horror the hurricane which caused a loss of more than 5,000 human lives and a destruction of property to the estimated value of $20,000,000 at Galveston, Texas, September 8, 1900. A detailed description of this hurricane can be given only when more complete reports are received from points along its path. Sufficient data are, however, at hand to permit a summary of its more prominent features. The track of the hurricane and the general meteorological conditions which attended it on the mornings of September 5, 8, and 11 are shown on the accompanying charts.

The presence of a disturbance in the vicinity of the Windward Islands of the West Indies was indicated by reports of the closing days of August. During the first three days of September this disturbance moved westward over the Caribbean Sea, and on the night of the 4th recurved northward over west-central Cuba. By the morning of September 6 its center had reached the southern Florida Peninsula. Thus far in its course the disturbance had followed a normal path, and its only notable feature was excessive rainfalls in Jamaica and eastern Cuba. During September 6 the storm made an abnormal recurve to the westward, increased in intensity, and caused severe gales from the western Bahamas over Florida. Passing westward over the Gulf of Mexico, the storm center reached the Texas coast late in the afternoon of September 8, where it recurved northward and passed directly over Galveston a fully developed hurricane.

The maximum wind velocity recorded at Galveston was 96 miles an hour from the northeast at 6.15 p. m., 75th meridian time, and

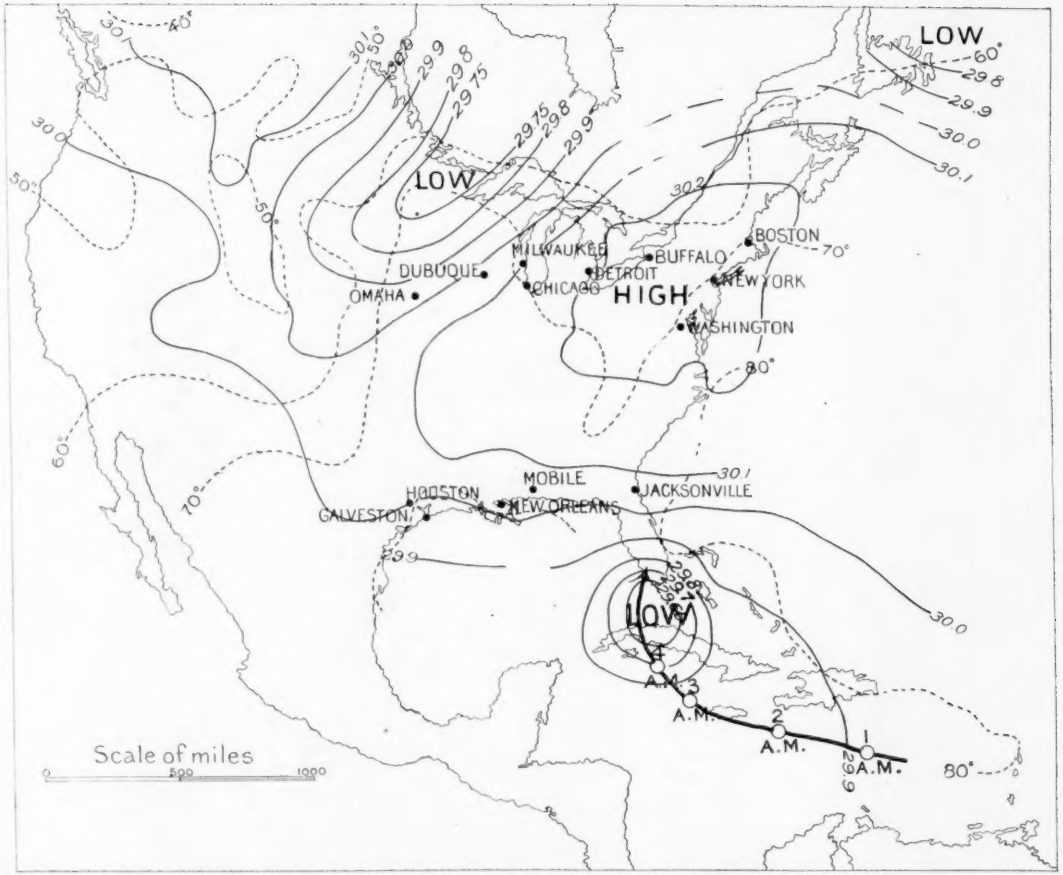

Chart No. 1. Showing Track of West Indian Hurricane, 1900

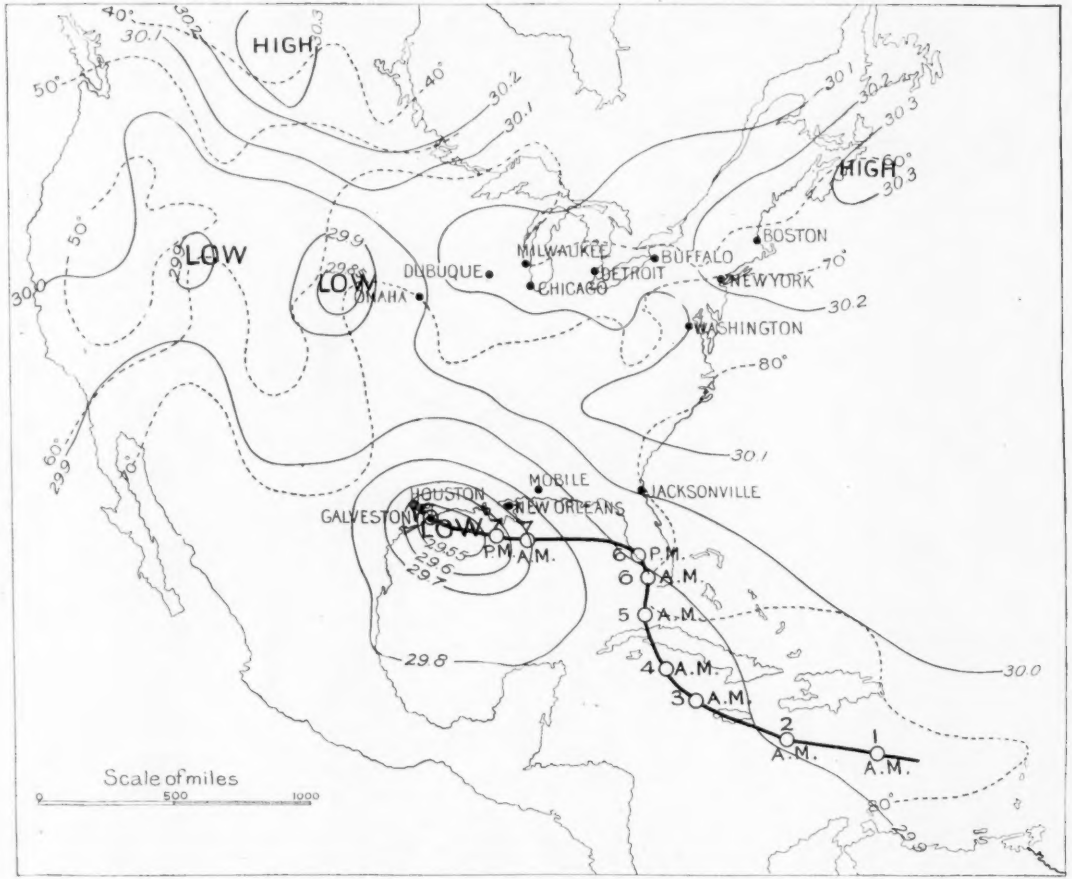

CHART No. 2. SHOWING TRACK OF WEST INDIAN HURRICANE, 1900

the observer reports a greater velocity from the southeast after the anemometer had been blown away. The lowest barometric reading indicated by the barograph was 28.53 inches at 8.10 p. m., 75th meridian time, at which hour the vortex of the hurricane passed Galveston. The tide, which came in rapidly during the afternoon and the early portion of the night, covered the entire city to a depth of six to fifteen feet, and swept the southern and eastern portions of the city entirely away. The water began to subside slowly at 11 p. m. of the 8th, and by the morning of the 9th high portions of the city were dry.

Following its northward recurve, the disturbance advanced northward over Texas, Oklahoma, and eastern Kansas, and arrived in Iowa the morning of September 11. During its passage over the interior of the country on the 9th and 10th, the storm was unattended by violent winds, and its entire dissolution was probably averted by the advance of a low barometer area from the northwest, which recruited its waning forces. Thus strengthened, the storm under discussion passed eastward over the Great Lakes and the St Lawrence Valley and thence over Newfoundland, constantly increasing in intensity. It then disappeared beyond the region of observation, having described a charted path more than four thousand miles in length.

As satisfying descriptions of storms require a reference to the meteorological conditions which appear to contribute to their normal and abnormal movements and cause the varying degrees of intensity exhibited, the following statement of these conditions, made by the writer some years ago, is presented:

The recurve of storms in the West Indies and over the Gulf of Mexico is dependent on general meteorological conditions, and more especially on the distribution of atmospheric pressure. The anticyclonic or high pressure area of the North Atlantic Ocean lies northeast of the West Indies, and causes east to northeast winds over the Southern Atlantic Ocean and the Caribbean Sea. These are the northeast trade winds. The storms that develop in the region east of the West Indies, and also those of a more western origin, have a tendency to follow the course of the main equatorial current over the Caribbean Sea. This course is doubtless largely influenced by the general drift of the atmosphere in that region, and, following the anti-cyclonic circulation of winds, the hurricanes skirt the western quadrants of the Atlantic high area, and, carried by the main atmos-

pheric currents, follow paths which recurve north and northeastward near the southeastern coasts of the United States. As a majority of the hurricanes traced have followed the course indicated, it may be considered the normal course of West Indian storms when the usual meteorological conditions obtain over the Atlantic Ocean and the United States. Some of the more important storms of the West Indies have not recurved northward, but have moved westward over the Gulf of Mexico and dissipated over Mexico or the southwestern states. In such cases persistent high barometric pressure to the northward covering their normal line of advance has apparently prevented a recurve.

Observation has shown that storms are commonly more violent in the region where they recurve or attempt to recurve abnormally. Observation has also shown that when the advance of a storm is obstructed and it is held back by an area of high pressure, it acquires greater intensity on assuming an abnormal course. Among notable storms of this class may be mentioned the hurricane of August, 1886, which totally destroyed the city of Indianola, Texas, and the hurricane of September, 1888, which raged with destructive violence over Cuba. These storms were apparently unable to recurve owing to high barometric pressure to the northward. Forced westward, they developed intense energy and dissipated, one on the southeast slope of the Rocky Mountains and the other over Mexico.

It will be observed that the storm of September, 1900, made two rather sharp abnormal turns in its course, and that manifestations of increased energy attended these recurves. It will also be noted that while the storm was most intense on the Texas coast, it exhausted its energy at that point and did not again become formidable until after its union with the northwestern disturbance. The scene of the first of these recurves was the southern Florida Peninsula, and the date was September 6. A reference to the chart of the morning of the 5th will show that the future course of the storm was not clearly indicated by the conditions thereon presented. The middle and north Atlantic coast districts were covered by an extensive area of high barometer, and an area of low barometer was crossing the northwestern states in an easterly direction. The apparent activity of the northwestern low area and decreasing pressure east of the Mississippi River indicated a probable path northward along the Atlantic coast. It was also evident that excessive speed on the part of the northwest depression would result in a failure on its part to dissipate

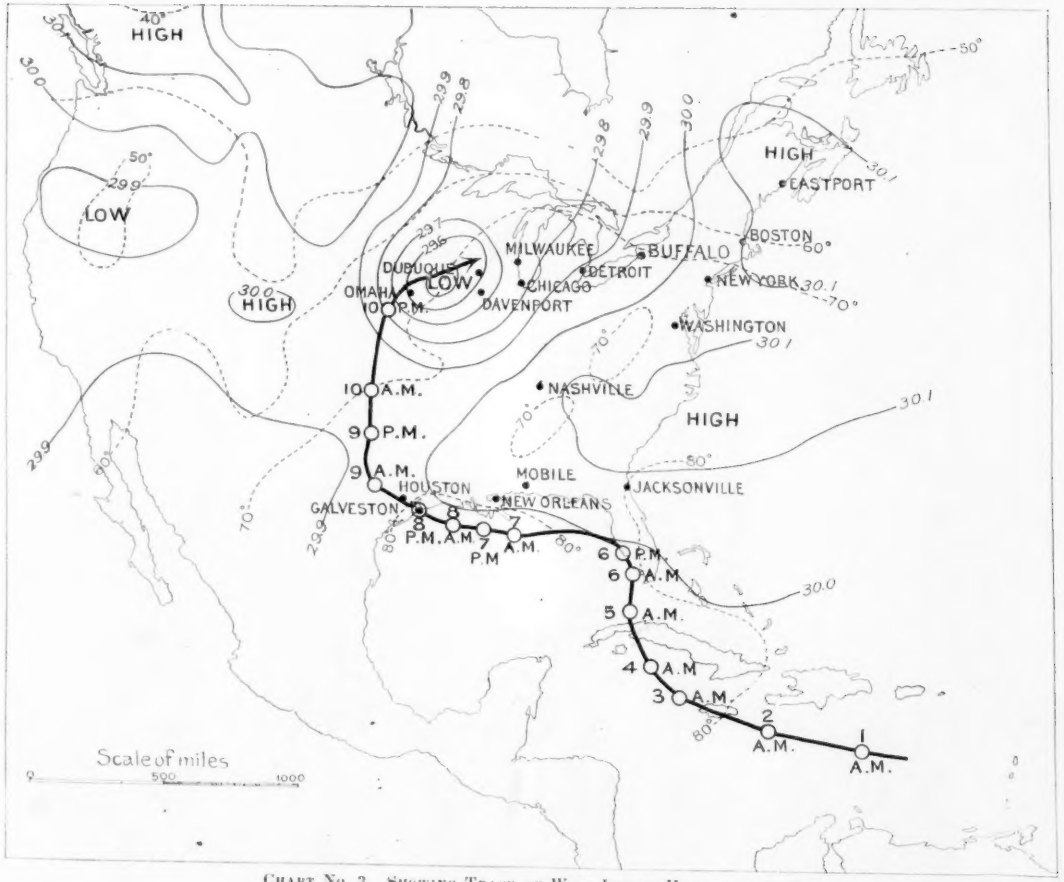

Chart No. 3. Showing Track of West Indian Hurricane, 1900

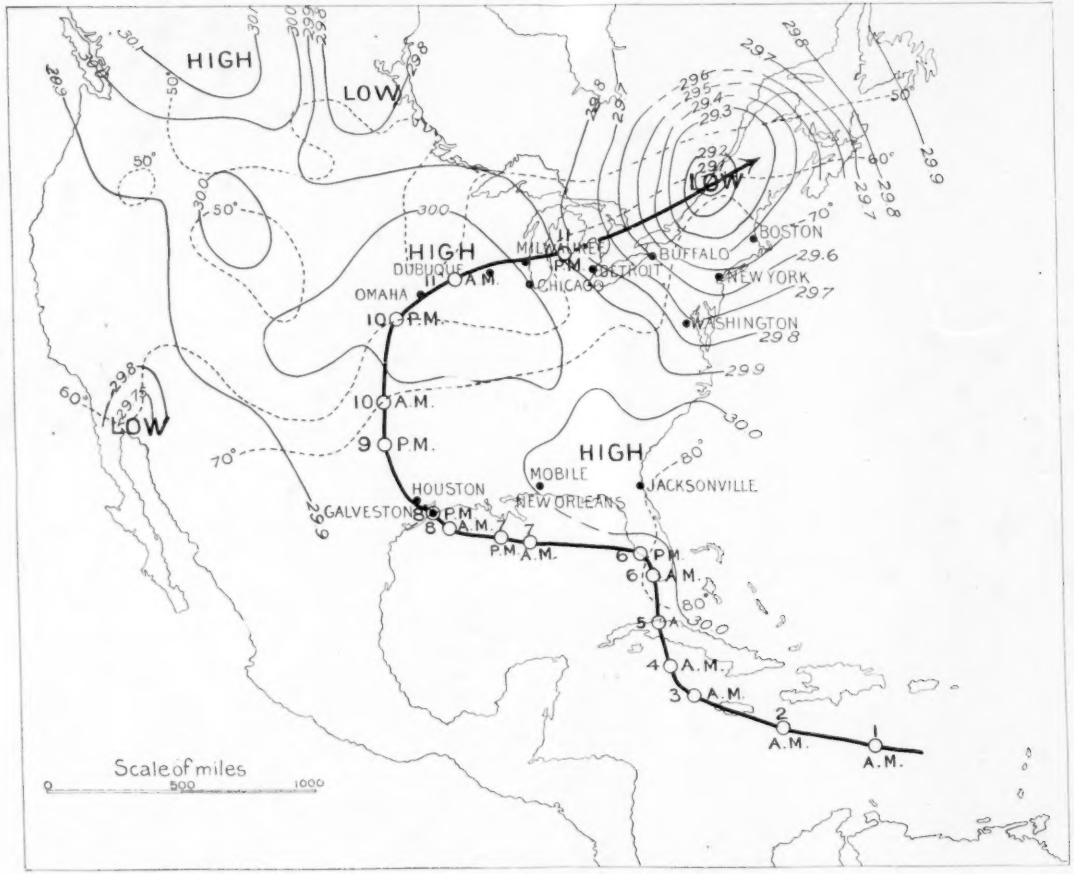

CHART No. 4. SHOWING TRACK OF WEST INDIAN HURRICANE, 1900

the Atlantic coast high barometer area and favor a rapid eastward advance of the area of high barometer which occupied the Northwest. It was recognized that these movements would prevent an opening for the storm along a normal line of advance and would cause it to assume a westerly course over the Gulf of Mexico. The chart of the 6th shows that the latter assumption was the correct one, and the reports of the following day failed to show a favorable opening for a northward course over the middle Gulf districts.

On the morning of the 7th the storm was central south of the mouth of the Mississippi River, and reports from Gulf coast stations furnished evidence of its marked strength and subsequent course. But neither these reports nor those of the morning of the 8th indicated a coördination of storm energies which would overwhelm Galveston Island with waves of unprecedented magnitude from both the Gulf and the Bay.

The principal agent of destruction at Galveston was water from the Gulf of Mexico and Galveston Bay. The wind, which doubtless exceeded a velocity of 100 miles an hour, was chiefly important as a cause of the high seas. During the afternoon of the 8th, the highest tide ever experienced at Galveston began to run in from the Gulf *against* the wind. This was a storm wave impelled by the advancing hurricane. Simultaneously waves from Galveston Bay, driven by a northerly gale, covered the inner side of the island.

From available information it appears that the hurricane reached its maximum intensity and the water its greatest depth about 8 p. m., 75th meridian time. After the passage of the hurricane center the wind shifted to southeast and south, the storm waves from the Gulf began to subside, and the upheaved waters of the Bay, meeting the shifted wind, were returned to the place from whence they came.

The geographical position and the topography of Galveston Island render it, in the presence of severe storms, peculiarly subject to inundation. In common with all low-lying districts on the coasts of great bodies of water, it has occasionally been covered by high tides which have been caused either by onshore gales of unusual severity or by waves which have run ahead of the vortex of a hurricane. On September 8 both of these causes contributed to the overflow of the island. The storm wave from the Gulf, combined with the influence of the gale which swept over thirty miles of water surface in the Bay, heaped water from both the Gulf and the Bay over the long narrow strip of sand which composes Galveston Island. The floods thus

produced exceeded by eight or nine feet any previous flood which has visited the city of Galveston, and the almost irresistible force of the enormous waves, together with the strength of the hurricane winds, resulted in a disaster which is without a precedent in the history of the United States.

Assuming that the reading of the barometer reported at Galveston the evening of the 8th was approximately correct, the hurricane at that point was of almost unparalleled severity. The future possibility of a like visitation in that locality is extremely remote.

EXCAVATIONS AT NIPPUR

Many important discoveries have been made during the past eleven years by various expeditions excavating in Babylonia under the auspices of the University of Pennsylvania. Nippur has been identified with ancient Calneh, mentioned in the Book of Genesis (chapter x, verse 10), and the history revealed of Babylonian civilization during a period more than seven thousand years before Christ; but the present year has witnessed the most extensive and valuable discoveries yet made.

These discoveries are three: The library of the great temple at Nippur has been located and opened. Seventeen thousand tablets covered with cuneiform writing have been taken out, and Professor Hilprecht, the able leader of the party, asserts that 150,000 additional tablets are waiting to be uncovered. These tablets are of special value because of their national character; upon them are written the myths and tales of the ancient wars of the Babylonians and their rules of language, of mathematics and astronomy. The library was of great renown in early Babylonia; it was their great college of law and religion.

Under 70 feet of rubbish, the accumulations of as many centuries, Professor Hilprecht found in the southwestern section of the city a palace with 600 feet frontage, probably the dwelling of the priest kings of Nippur. In the rooms excavated, pre-Sargonic tablets, seal cylinders of the earliest type, and clay figurines were found. The walls of Nippur were uncovered for several score yards, and everywhere, especially in the lower strata, weapons of curious devices were unearthed, showing the methods which besieging armies used in those ancient times.

HUNAN—THE CLOSED PROVINCE OF CHINA

By William Barclay Parsons

Of the eighteen provinces which constitute the Chinese Empire proper, the only one which until recently had not been explored or mapped by foreigners was the province of Hunan, extending from the Yangtze to the Nanling Range, or between the 30th and 25th parallels of north latitude and between the 109th and 114th meridians of east longitude, a province with an area of about 80,000 square miles and an estimated population of 21,000,000. Since the subject of the development of the interior of China has been considered, the province of Hunan has been regarded as one of the great objectives of the railway and mining promoter on account of its well-known wealth in coal and other minerals, the fertility of its soil, and the superior ability of its people. The people themselves, however, are the most clannish and conservative to be found in the whole empire, and have succeeded in keeping their province practically free from invasion by foreigners or even foreign ideas.

In 1871 Baron Richtofen, the great German geologist, to whose investigations we owe the greater part of our knowledge of the geological structure of China, made a trip from south to north across Hunan to report on the coal areas of the province to the Shanghai Chamber of Commerce; but his journey was confined wholly to boat travel, and therefore the information that he obtained was very limited. Three years previous to this Raphael Pumpelly, the American geologist, had attempted to explore Hunan by proceeding by boat up the Siang River from the Yangtze, but he was not allowed to land, and finally was forced by the people to turn back after having reached, but not entered, the capital of the province, Changsha. In 1878 Mr G. J. Morrison, an English engineer, traveled from north to south across Hunan by boat, as he also was prevented from making the journey on foot.

In the winter of 1898–'99, the writer, retained as chief engineer of the American syndicate holding a concession for a railway from Hankau to Canton, accompanied by a staff of American engineers, undertook to conduct a survey from Hankau to Canton through the province of Hunan and, of course, by land. In this attempt he was entirely successful, making an instrumental survey for the entire distance—a

length of line, as actually run, of 742 miles—together with reconnaissance work for about 300 miles more. As the result of this survey he has been able to delineate the Siang River and the striking features of the geography and topography of the eastern part of the province of Hunan, and present the first correct map for at least the main drainage line of the province.

MAP OF EASTERN PART OF HUNAN AS DELINEATED BY WM. B. PARSONS.

The province is watered by two streams—the Siang and the Yuan. They meet at the northeastern corner of the province and flow into the Yangtze, forming the most important tributary that the Yangtze receives from the south. The Yuan, the lesser of the two, rises in the province of Kuichau, flows easterly across the northwestern corner of Hunan, and joins the Siang in the Tungting Lake, a large area which in the winter time is dry, except in the beds of the channels of the two streams, which are cut in the alluvial soil to a depth of about 20 feet. In the summer time, when the river rises, this whole area is flooded, forming the lake. The Yuan, with its tributaries, drains, approximately, 27,000 square miles, or about one-third of the province, the remainder being drained by the Siang. The Siang rises in the southwestern part of Hunan, flows in a general northeasterly direction, and drains the north slope of the Nanling Mountains, which form the watershed

between the Yangtze and the China Sea. When reaching latitude 27° N. the Siang River makes a bend at an angle of about 45°, and thence flows practically due north to its junction in the Tungting Lake with the Yuan and with the Yangtze.

The route projected by the American concession through the province of Hunan was a north and-south line following the Siang from the Yangtze to the point where it makes the bend above mentioned. Here the Siang receives a tributary flowing from the south, the Leiho, which, with its tributary, the Yutan, rises in the Nanling Range itself. This watercourse is not only the main drainage line of the eastern part of the province, but is the great trade route of Hunan, communication in the interior being confined chiefly to the rivers. The projected railway route leaves the Siang at its junction with the Leiho and follows the latter to within a mile of Chenchau, then, after crossing the Nanling Range at Parson's Gap, follows the Wei and Pei Rivers to Canton.

At the outlet of the Tungting Lake is Yochau, a city of about 40,000 inhabitants, recently declared a treaty port where foreigners may reside. Yochau has attained its importance by being at the junction of the Siang and the Yuan rivers with the Yangtze, and so becoming the gateway of the province. One hundred miles up the Siang is Changsha, the capital of the province, and consequently the official residence of the governor and the other provincial officers. This city has a population of at least 500,000, and the Chinese claim 1,000,000 for it. It is a walled city of the first class, with considerable manufacturing industries in furniture, pewter-ware, and paper, and although heretofore foreigners have been expressly forbidden to enter it, its shops are filled with all kinds of foreign as well as Chinese goods. Thirty miles above Changsha is Siangtan, stretching along the west bank of the Siang for a distance of three and one-half miles. Siangtan is at the head of large junk navigation, the river shoaling rapidly above this point. It is therefore the distributing point for the central part of the province. The ancient city is small, and within its walls are located the official yamen and other similar public buildings. The modern city of Siangtan lies wholly without the walls, and is given over entirely to commerce.

One hundred and ten miles above Siangtan is Hengchau, at the point where the Siang River makes its bend from its easterly to its northerly course. The Chinese claim for Hengchau a population of 200,000. As the available depth for boats in winter is here again

seriously reduced, compelling transfer from medium-sized junks to *sanpans*, the city has become the great market for the southern part of Hunan.

These cities mark the four great trading points in the eastern part of the province, the most populous and flourishing portion. But there is one more that should be added to the list as a place of commercial importance, namely, Changte, on the Yuan, the head of large junk navigation on that stream.

The accompanying map, the result of a careful instrumental survey, locates the Siang River and the junction of its various tributaries from the Tungting Lake southward to where it receives the waters of the Leiho, and thence the Leiho and its tributary, the Yutan, to the Nanling Range. The location of the river itself and also of the principal cities on its banks is also given. It is almost unnecessary to add that the position of the various details differs considerably from the preconceived location.

The Siang River, like all other streams in China, is subject to an annual rise in the spring, the high waters occurring in May and June and the low period in December and January. During the latter months a depth of only three feet is the most that can be counted on as far as Siangtan, this depth being governed by frequent shoals. Between Siangtan and Hengchau junks must draw not over one and a half feet. On the Leiho the draught of water is limited to one foot to Yungshing, and above that point only the small sanpans are able to ascend in the winter time to Chenchau. In the summer time the flood waters will give a depth of from 10 to 30 feet above the low-water stage.

Although the flood occurrences of the Siang are similar to those of the Yangtze, the character of the stream is quite different. The alluvial nature of the Yangtze Valley soil practically terminates at the south side of the Tungting Lake. From that point southward the Siang River flows through a rocky or gravelly soil formation, so that its waters, unlike those of the Yangtze, are clear. It is a stream that might be improved for navigation purposes; but such work would require a large amount of initial dredging and then a continual annual expense in the same kind of work to maintain a channel. After this was accomplished it would be subject to the annoyances and inconveniences due to a great rise and fall in the river level, with a consequent swift descending current in the summer months. The building of a railroad would probably cost no more than the

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initial expense of improving the stream, and its annual maintenance and operation would not exceed the annual maintenance and operation of the river, and, of course, be a vastly more satisfactory means of communication.

The topography of the Siang Valley at the northern end is similar to that of the Yangtze Valley, the hills being low, somewhat broken, and set back from the river. As one follows the Siang up its course the nature of the abutting country gradually changes; the hills become more pronounced in their character and more continuous in their formation, and gradually contract toward the stream. On reaching the Leiho they rise directly from the river itself, leaving but a narrow fringe of arable land along the river or along the small tributaries flowing into it. The Yutan and the other small streams which flow into the Siang take their rise in the Nanling Range, the peaks of which have an elevation along the southern borders of Hunan of from 5,000 to 7,000 feet above sea-level.

The southern half of the province is one vast coal-field, both anthracite and bituminous, although Baron Richtofen stated in his report that no bituminous coal was to be found. His error was due to the fact that the Chinese would not allow him to land, and that he was therefore compelled to judge the field by the appearance that it presented along the river and from such information as he could gather from the natives.

The geological structure of the country is much disturbed, the stratification having a dip of from 30° to 45° in some localities. This disturbance has resulted in so breaking up the coal deposits as to render them soft and friable. In other localities, however, the disturbance has had less serious force, and coals are found of a hard, firm texture, some of the anthracites being sufficiently hard and of such a chemical composition as to permit of their use in blast furnaces.

There are three well-known passes in the Nanling Range, across which trade routes run between Canton and North China. The most easterly is the Meling Pass, between Kuangtung and Kiangsi, with an elevation said to be not over 1,000 feet and across which traffic passes to and fro between Canton and the province of Kiangsi. The westerly one is at the headwaters of the Siang itself and of the Kai Kiang. Here a canal has been constructed, so that it is actually possible to go from the China Sea into the Yangtze Valley by boat. The Kai Kiang flows through the province of Kwangsi into the Wes

River, making so long a detour to reach this low gap that this route has not been used as much as the Meling on the extreme east, or the most celebrated of the three passes, the Cheling, in the center. The Cheling Pass represents a land portage of 15 miles on either side of the mountains between the navigable waters of the Yutan on the north and the Wei River on the south. Baron Richtofen determined its elevation by barometer observations as about 1,000 feet above sea-level. Mr Morrison, the English engineer, when he crossed the pass in 1878, estimated the elevation by the same approximate method as 1,200 feet. The instrumental survey made under my direction determined the elevation to be 1,190 feet, which probably represents the correct elevation within a very narrow possible margin of error. It is a singular fact, however, that the Chinese failed to find the low point at Cheling. As soon as I began the work of reconnaissance across the range, in order to make out the best route for the survey line to follow, I discovered that the Chinese in building this highway, three or four thousand years ago, had quite failed to grasp the true topographical situation. The true pass across the range lies some three miles to the north of the present highway and at an elevation of something like 110 feet lower.

The rock formation of the range itself is limestone, and, although the valley which marks the pass is sharp and well defined, its presence is almost entirely obscured by the existence of five extraordinary dikes crossing the valley from side to side, and through and under which the streams have been obliged to find their way. A man standing at either end of this valley, which has a length of about four and a half miles, would feel absolutely certain that no valley existed on account of the high walls of limestone, which appear to be a solid barrier. It was only after climbing to some eminence, whence a bird's-eye view of the whole valley can be obtained, that I discovered its existence.

The dikes occur in pairs at the ends, with a single one crossing the valley at about the half-way point. At the north end these peculiar rock walls have a height of about 90 feet, rising to a sharp edge on top and separated by a well-defined basin 1,000 feet across. At the south end the dikes are larger, being about 150 feet high and 1,900 feet apart. The divide of the Yangtze and China Sea waters occurs just south of the northern pair of dikes and is quite clearly defined. During the rainy season it is probable that water will be found flowing in opposite directions at no greater distance than a few hundred

yards, one stream to swell the Yangtze, the other flowing southward and ultimately into the China Sea, 800 miles away.

The presence of this pass will permit a railway line to be constructed between Canton and Central China with an abnormally low ruling gradient. The distance by rail between Hankau and Canton will be about 700 miles. Of this distance 690 miles need have nowhere a gradient exceeding one-half of one per cent, that rate being used crossing the spurs as they jut out to the Siang or the Pei River. The range itself can be crossed by five miles on either side of ascending gradient not exceeding one per cent, including an allowance for the existence of curves.

In Eastern Asia the magnetic variation is small. At Hankau the variation was found to be 45′ E. and at Canton 20′ W. We located the line of no variation just after crossing the Nanling Range.

South from the Nanling Range, at the Meling Pass, flows the Pei River, and south from the Cheling Pass flows the Wei River, the two streams joining at Shaochau, the combined stream taking the name of the Pei River, which it retains to the junction with the West River at Samsui.

Kuangtung has been explored by foreigners, and the larger part of it has been carefully mapped, certainly as high as Shaochau. I am not aware that an actual survey of the Wei River has been previously made, but its correct course is shown on the map which accompanies this paper. The line covered by our survey and shown on the map is one of the oldest and most important trade routes in the country, of which no accurate and definite information was hitherto available. The country is populous and rich, especially in minerals, and will be one of the great factors in the coming material development of China.

NATIONAL GEOGRAPHIC SOCIETY

The active membership ticket for the season 1900-1901 will admit only one person to lectures instead of two as heretofore; but members will have the privilege of purchasing one season ticket, admitting one person, for two dollars, if desired. This change has been decided upon in pursuance of certain recommendations made by President Bell to the Board of Managers last June. The substance of the address is here given, by direction of the Board, for the information of members.

ADDRESS OF THE PRESIDENT TO THE BOARD OF MANAGERS, JUNE 1, 1900

The National Geographic Society should be *in fact* what its name implies—a national organization with national representation. The plan that has been adopted in the past of confining its active membership to residents of the city of Washington, D. C., has made of it practically a local society, although its charter is broad enough to enable it to take in all who are interested in geographic science.

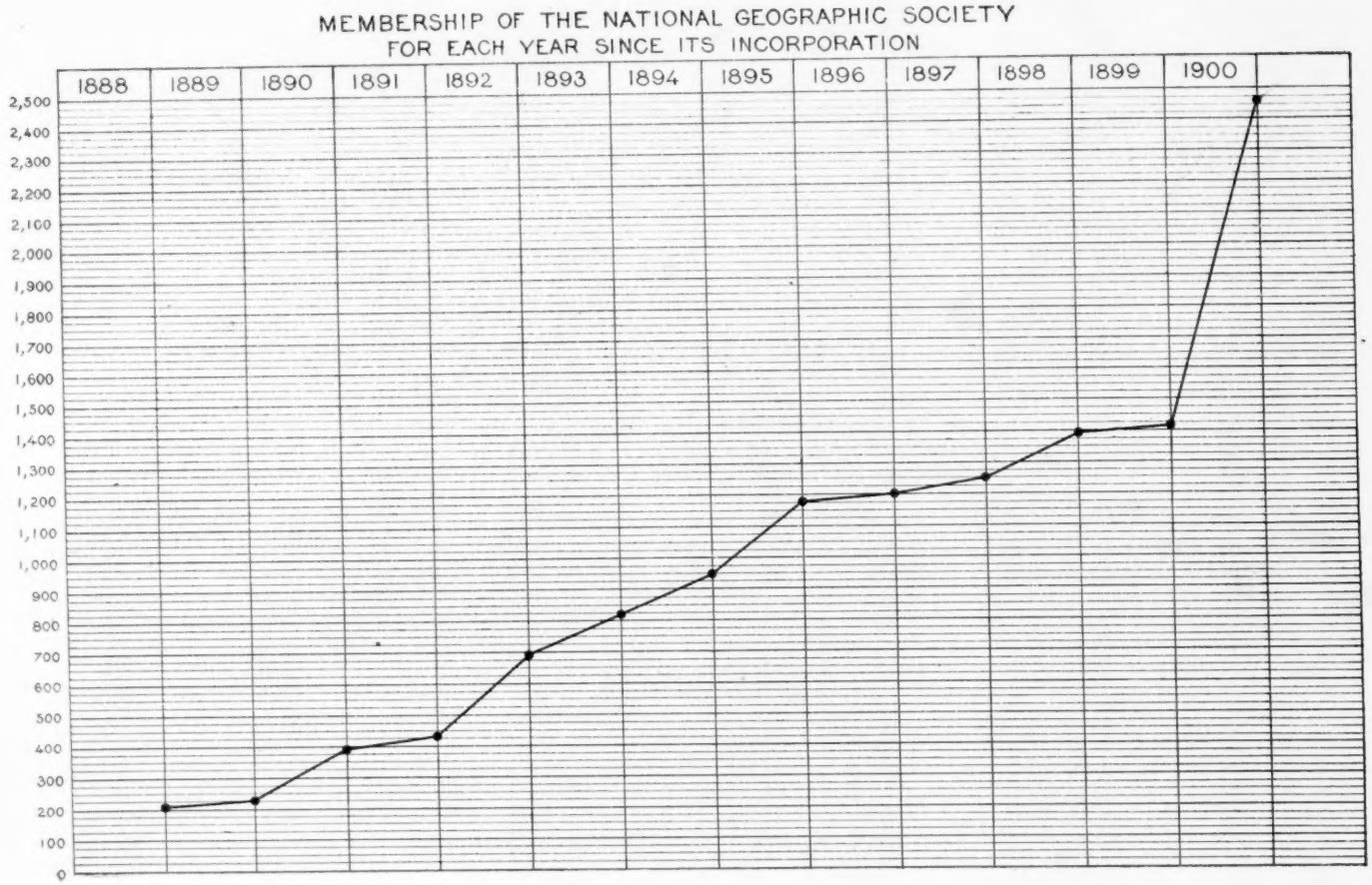
It was the policy of our late President, Hon. Gardiner G. Hubbard, and it has been my policy since taking the reins of office, to enlarge the outside membership so as to place the Society upon a national plane.

As we only come in touch with outside members through the NATIONAL GEOGRAPHIC MAGAZINE, it seemed to be the part of wisdom to begin our efforts at expansion by devoting special attention to the Magazine. It has always been recognized as one of the best geographic periodicals in existence; but our editorial staff has been composed of busy men, having their primary work in life in other fields of labor, so that the Magazine, although excellent in quality, was sometimes crowded out by other work, and appeared irregularly.

I felt so convinced that the Magazine would prove to be the lever to move the Society into the desired position that last year I recommended, as an experiment, that arrangements should be made whereby one of the editorial staff should be enabled to devote his whole time to the interests of the Magazine and the growth of the Society. The plan was approved; the experiment has been made; the year of trial has passed, and we have now to consider the results.

First, in regard to the Magazine: The editors are to be congratulated on the fact that they are now able to get the Magazine out on time, so that it is now reviewed along with the other monthly periodicals of even date—such journals as the *Review of Reviews* reprinting several of the longer articles. The multitudinous press cuttings received through agencies indicate that the excellence of its contents is recognized very generally by the press of the country, and that newspapers in many different parts of America are quoting from its pages.

The Magazine is undoubtedly exerting a greater and more widespread influence than it has ever done before.


MEMBERSHIP OF THE NATIONAL GEOGRAPHIC SOCIETY
FOR EACH YEAR SINCE ITS INCORPORATION
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
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Now, as regards membership: The graphical chart on the opposite page shows the number of members for each year since 1888:

Starting in 1888 with a total membership of 209, we note a continual and steady increase up to 1899, when we had 1,417 members. Since then the membership has increased to such an extent that it has almost doubled in a single year (1,417 members in 1899, 2,462 members in 1900).

It is obvious, then, that we are moving in the right direction. There is every prospect that attention to the Magazine and to the needs of our outside members will result in an increase of membership so great that we may hope in a few years to have thousands of members where we now have hundreds, and to establish on a lasting foundation a great national society of which we may all be proud.

I would therefore recommend the adoption of the policy of national expansion, and ultimately, when the proper time arrives, of national representation in the Society, with voting power not limited to the residents of Washington, D. C. *Already the Uitlanders outnumber the Boers, 1,264 corresponding to 1,198 active members.**

With this policy in view we may consider various steps that might be taken to bring about the desired result.

NATIONAL EXPANSION

We must pay every attention to our outside members and do everything we can to hold their interest.

(1) At present we can only reach them through our Magazine, and therefore every effort should be made to keep up its character, so that outside members may feel that it is to their advantage to be associated with the Society and receive its publications. It is of the first consequence to success that *the Magazine should appear promptly on time;* that its contents should be up to date, dealing largely with the geography of current events and those topics that are engaging public attention; that the articles should be treated in a non-technical manner, so that all our members may understand them, and that the Magazine should be profusely illustrated with maps and pictures of life and action.

(2) Special privileges might be given to members by affording them the opportunity of purchasing through the Society at reduced rates geographical works, books of travel, histories, etc. A large

*The membership at present (September 15, 1900) is 2,622, of whom 1,413 are corresponding and 1,209 active.

society like ours could easily make arrangements with publishers for the purchase of books upon special terms.

(3) I would also suggest the appointment of a special lecture committee to provide lectures outside the District of Columbia. Our Washington lectures have been of great value and importance and have proved to be very attractive to our members and the public generally. Indeed, it has been difficult to find a hall sufficiently large to accommodate our audiences. It would be entirely practicable to establish similar courses of lectures in some of the larger cities of the United States, and members should have the privilege of purchasing season tickets at less price than the public at large.

It is perfectly certain to me from the experience of the past (see diagram above), that the general membership of the Society will not increase at anything like the rate it has done this year, and that we may even anticipate for next year a falling off rather than an increase, unless special efforts are made to push the membership; and it is equally certain to me, from the great and sudden increase that has followed our experiment in this direction, that continuous and persistent efforts will be rewarded with success; but they must be continuous and persistent. The rise in the curve is too sudden to last, unless special attention is paid to the matter.

RECOMMENDATIONS FOR FUTURE, NOT IMMEDIATE, ACTION

I would also suggest, as a matter not for immediate action, but for discussion and thought, the advisability of amending our by-laws at the next annual meeting of the Society, in May, 1901, so as to abolish the distinction between active and corresponding members. Let all be active members, with a uniform membership fee sufficient to cover the expenses of the Society, with the exception of lecture courses, which should be made to pay for themselves and yield a revenue to the Society to be used for the promotion of geographic research.

The object of this Society is "the increase and diffusion of geographic knowledge." We have done a great deal to diffuse geographic knowledge, but very little to increase it. Our lectures have been so popular as to overshadow the scientific work of the Society. Even our technical courses have been so largely attended as to prevent discussion. *We have been swamped by our own success*, and we have found it increasingly more difficult to hold meetings of a technical character similar to those held by other scientific societies.

I would urge upon the Board the advisability of creating within

the Society a special body of members to be known as Fellows, to be selected from the general membership of the Society for their special knowledge of matters relating to geographic science. These Fellows should form a small body of picked persons and should hold meetings to promote the *advancement* of geographic knowledge.

In spite of our large membership, we are in so poor a condition financially that we have no invested funds to promote the objects of the Society. We live, as it were, from hand to mouth, and have even had difficulty in making both ends meet. This condition of affairs is dangerous and threatens the existence of the Society. In order to give it stability it must have funds, and without a surplus it cannot hope to do much toward promoting geographic research.

I would urge upon the Board the importance of taking immediate steps to create an invested fund for the Society, and I would propose to utilize our lectures for this purpose.

Lecture courses in Washington and other cities could, I am sure, be made to yield a profit to the Society. The proceeds could be turned over to a committee for investment to form a fund for the promotion of geographic research, and the income could be applied as directed by the Fellows of the Society.

These recommendations, of course, are revolutionary in character, and should not be adopted without full time for mature consideration and discussion. I bring them forward now in order that the members of the Board may think them over carefully so as to be prepared to carry them into effect at the Annual Meeting of the Society in May, 1901, if they think best.

RECOMMENDATIONS FOR IMMEDIATE CONSIDERATION

At the present time active members have the privilege of attending all lectures free of charge, and have also the privilege of bringing a friend. Thus it has happened that our audiences have been composed in considerable part of persons who are not members of the Society. Such persons, I think, might very properly be asked to pay. I would therefore suggest that during our next lecture season the membership ticket should admit only one person instead of two.

In order that there should not be too sudden a change in this respect, I would suggest that each member of the Society should have the privilege of purchasing a season ticket, admitting one person, for the sum of three dollars (which represents that proportion of the active membership fee which is intended to cover lectures). In the

case, then, of an active member who desires to bring a friend, he could have the same privileges as now for the sum of eight dollars instead of five.

It is not always easy to make a change involving increased expense to members. In my opinion, however, it is absolutely necessary that some change should be made in this direction at the present time. The superb lectures we provided during the past year were actually given to members and their friends at the *average rate of five cents per lecture.* [The active membership fee was five dollars. Allowing two dollars for the Magazine—the same amount paid by corresponding members—the extra amount of three dollars was charged for the purpose of paying the expenses of lectures. During the past year we gave thirty lectures (see pages 415, 416) for this amount, three dollars, which is at the rate of ten cents per lecture, but as each member's ticket admitted two persons, the actual *per capita* amount received for each lecture was only five cents.]

Surely our members and their friends would gladly contribute a larger amount than this.

In my opinion, we have been in the habit of giving too many lectures. I recommend that, next season, we limit the number to twenty. Then, upon the plan proposed, we should receive from members and their friends the sum of three dollars each for twenty lectures. This means an average *per capita* amount of fifteen cents per lecture. This would give us twice as much for twenty lectures as we have hitherto received for thirty, and at two-thirds the expense for rent of halls, etc.

A HOME FOR THE SOCIETY IN WHICH TO ESTABLISH NATIONAL HEADQUARTERS

If we are to become a great national organization with branches in different parts of the United States, it would be very advisable that we should have a building of our own in Washington as a permanent home for the Society in which to establish the national headquarters. In this connection I am glad to inform the Board that the plans for the proposed Memorial Building to our late President, Hon. Gardiner Greene Hubbard, are gradually taking form and assuming a practicable phase, and it is not unlikely that a Memorial Building may be erected this year and offered for the use of the Society.

It is proposed that the building should contain a few small rooms that could be used as offices, a library and map-room, and a hall or meeting place sufficiently large to seat about 100 people. This

would accommodate the Board of Managers and committees of the Society, and also permit of small scientific meetings of the Fellows of the Society. The Memorial Building, if erected, will place us in a much better position to receive the International Congress of Geographers, which has been invited to assemble here under our auspices.

Everything seems favorable to the establishment of the Society upon a permanent basis, and it only remains for you to take the necessary steps to convert the Society into a really national organization with national representation.

In conclusion, allow me to recapitulate in brief the most important parts of my recommendations:

RECOMMENDATIONS SUMMARIZED

Policy: Let the guiding policy be *National Expansion*, with the object of having in the near future national representation, with voting power not limited to residents of Washington, D. C. (Adopted by the Board.)

RECOMMENDATIONS REQUIRING IMMEDIATE ACTION

1. Arrangements should be made whereby one of the editorial staff should be enabled to devote his whole time to the interests of the Magazine and the growth of the Society. (This has been carried into effect by the Board.)

2. Active membership ticket to admit only one person to lectures; members to have the privilege of purchasing an additional season ticket for lectures for three dollars. (This has been adopted by the Board with the exception that the additional season ticket is to be two dollars instead of three.)

3. Committee on Lectures to be appointed to arrange for lecture-courses in other cities than Washington; season tickets for these outside lectures to be sold to the public, and corresponding members of the Society to have the privilege of purchasing them at reduced rates. (The Board has appointed the following committee to consider and report: Marcus Baker, F. H. Newell, W. B. Powell.)

RECOMMENDATIONS NOT REQUIRING IMMEDIATE ACTION

1. Lower the membership fee for active members and remove the privilege of attending lecture-courses without special charge. Convert corresponding into active members with uniform membership fee for all, whether resident or non-resident, within the District, and do not limit the voting power to residents of the District of Columbia.

2. Lecture tickets to be sold for the benefit of the Society, members to have such privileges of purchase as may be determined upon by the Board; the object of the lectures to be to diffuse geographic knowledge and to raise revenue for the Society to enable it to establish a permanent invested fund for the promotion of geographic research.

3. Create within the Society a special body of members to be known as *Fellows*, to be selected from the general membership of the Society for their special knowledge of matters relating to geographic science, and let the Fellows hold scientific meetings of their own to promote the advancement of geographic knowledge, the income of the research fund to be applied as directed by them.

Respectfully submitted.

ALEXANDER GRAHAM BELL,
President of the National Geographic Society.

THROUGH THE HEART OF AFRICA

In the summer of 1898 two young Englishmen, Messrs E. S. Grogan and A. H. Sharp, left Capetown, bent on reaching Cairo by journeying through the heart of Africa. They said nothing of their project, for as no man had up to that time accomplished the feat there were doubts of their success, and, as Mr Grogan says, "failure is unpardonable." The journey as far as Zambezi was through territory comparatively well known and uneventful. Here their real forward movement began by steamer up the Shire River for 200 miles, then by road 100 more, where a second boat took them 500 miles to the northern end of Lake Nyassa. Then followed a second march on foot, this time of 200 miles, to the south end of Lake Tanganyika, and then by boat again 350 miles to the north end of the lake. The work of exploration began at this point. From here they advanced slowly and with toilsome marches. Mr E. S. Grogan, in *The Geographical Journal* for August, gives an interesting account of their experiences.

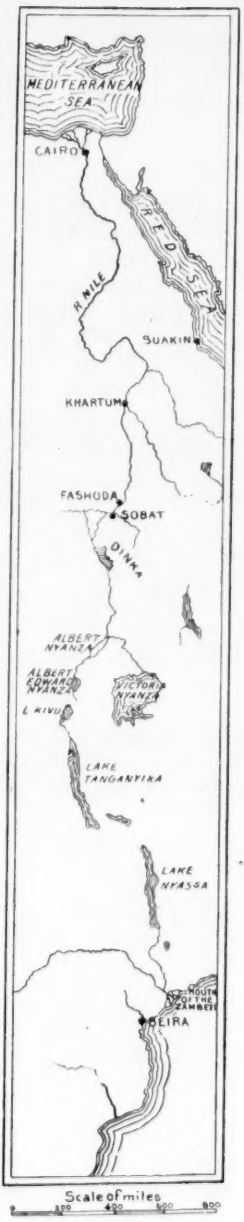
In the neighborhood of Lake Kivu he found evidences of a considerable degree of civilization. The hills were terraced for cultivation, the villages and cultivated lands inclosed by hedges, and artificial reservoirs provided with side troughs for watering cattle. The people here, who "are a purely pastoral folk, breeding a long-horned cattle," were divided into two classes—the Watusi, the aristocrats, probably descendants of the great wave of invasion of Gallas that penetrated in remote ages as far as Lake Tanganyika, who do no work beyond milking and butter-making, and the Wahutu, the aborigines of the country, who are to all purposes mere slaves of the Watusi. "All the cattle belongs to the king absolutely, but was held in trust by his satraps, who again parceled it out among the minor Watusi."

North of Lake Kivu is a region of volcanoes, two of which are still active. From reports from the natives Mr Grogan believes that one of the latter was formed during a terrific eruption only two years before his arrival. The main stream of lava flowed for a distance of 30 miles, engulfing the forest with which the valley was clothed, in many places piling up the lava and ash to a height of 30 feet. "The natives informed me," Mr Grogan states, "that whole herds of elephants were destroyed. I myself saw the bones of one that had been forced up to the top of the edge of the stream."

"In the plain to the north of Kivu, in the pass between the two blocks of volcanoes and on the slopes to the north, owing to the porous nature of the ground, there is no water; yet in spite of this there is an enormous population, the necessary water being obtained by tapping the stems of the banana palms. The moisture is retained by the ground, and consequently the forests that clothe the slopes of the volcanoes are wildly luxuriant and impenetrable to everything but the elephant. When hunting and following close on the tracks of an elephant we had to cut our way with a native axe, without which no one moves a yard. For hundreds of yards at a time one never touched the ground, but was climbing along the prostrate tree trunks and denser growth, which, of course, the elephant would take in its stride. More desperate work or more dangerous hunting it would be impossible to conceive."

In the neighborhood of these same volcanoes a curious type of mankind was observed, tall, with long arms, pendent paunch, and the short legs of the ape.

"When exploring with a small number of followers I observed some ape-like creatures leering at me from behind banana palms, and with considerable difficulty my Ruanda guide induced one of them to come and be inspected; he was a tall man, with long arms, pendent paunch, and short legs of the ape. At first he was terribly alarmed, but soon gained confidence, and when I asked him about elephant and other game he gave me most realistic representations of them and of how they should be attacked. I failed to exactly define their social status, but from the contempt in which they were held by the Waruanda their local caste must be very low. The stamp of the brute was so strong on



them that I should place them lower in the human scale than any other natives I have seen in Africa. Their type is totally distinct from the other people's, and, judging from the twenty to thirty specimens I saw, very consistent. Their face, body, and limbs are covered with wiry hair, and the hands of their long powerful arms, the slight stoop of the trunk, and the hunted, vacant expression of the face made up a *tout ensemble* that was a terrible pictorial proof of Darwinism. The pigmies are of similar build, but have the appearance of full-grown, exceedingly powerful men compressed, and with much more intelligent faces. The pigmies are to these ape-like beings as the dog-faced baboons are to the gorillas.

"Probably they are, like the pigmies, survivals of former inhabitants of the country, the difference in their type depending on the surroundings in which they have had to struggle for existence. The true type of pigmy is a magnificent example of nature's adaptability, being a combination of immense strength necessary for the precarious hunting life they lead and compactness indispensable to rapid movement in dense forest where the pig-runs are the only means of passage. While I was with the main caravan I never saw either a pigmy or one of these creatures, and to study them it is necessary to go unattended; this obviously entails great risk, and it is consequently very difficult to find out much about them. They both have the furtive way of looking at you characteristic of the wild animal, and, though I had one of these curious men with me for a week when I made the circuit of the volcanoes, he would always start if I looked at him, and he followed my every move with his eyes as would a nervous dog; he refused an offer of cloth for his services, and suddenly vanished into the forest without a word, though several times afterward I found him watching me even when I had returned to my camp on the base of Mount Eyres."

Mr Grogan had further experiences with another type of natives later in his journey.

"The Belegga, who inhabit the hills to the north and who were suffering terribly from the effects of the long drought, looked upon me as a great institution, and swarmed down in hundreds for the meat (an elephant killed in the hunt). A weird sight it was. Stark-naked savages, with long, greased plaits of hair hanging down to their shoulders, were perched on every available inch of the carcass, hacking away with their knives and spears, yelling, whooping, wrestling, cursing, and munching, covered with blood and entrails, the new-comers tearing off lumps of meat and swallowing them raw, the earlier arrivals defending great lumps of offal and other delicacies, while others were crawling in and out of the intestines like so many prairie marmots, old men, young men, prehistoric hags, babies, one and all gorging or gorged, smearing themselves with blood, laughing, and fighting. Pools of blood, strips of hide, vast bones, blocks of meat, individuals who had not dined wisely but too well, lay around in bewildering confusion, and in two short hours all was finished. Nothing remained but the great gaunt ribs, like the skeleton of a shipwreck, and a few disconsolate-looking vultures perched thereon."

Vast herds of elephants were met in the swamps of the Dinka region, through which the route lay for several hundred miles. Often "they formed

a serious impediment to our march, as they refused to move out of the way. Nearly every morning we wasted an hour shouting and throwing stones at solitary old tuskers and herds of younger elephants. Banks and banks of hippopotami lay in every direction, but other game was scarce. The mosquitoes were appalling and rapidly killed off two of my boys who had been sick, and the flies by day were even worse."

"The Dinkas have enormous droves of cattle, which they value very highly; they never kill them for food, but from time to time tap the blood, which they drink greedily. They are of colossal stature; some of the herdmen I saw must have been very nearly seven feet, and in every settlement the majority of the men towered above me, while my boys seemed the merest pigmies by their side. They smear themselves with a paste made of wood-ash to protect themselves from the bites of the mosquitoes, and the long lines of warriors threading their way in single file through the marsh appear like so many gray specters. They are absolutely nude, considering any sort of covering effeminate. Their invariable weapons are a long club made of bastard ebony, a fish lance, and a broad-bladed spear, and the chiefs wear enormous ivory bracelets. The southern Dinkas cut their hair like a cock's comb, and the northern Dinkas train their hair like a mop. Both bleach it with manure. Their method of showing respect is spitting on the object of their attention."

Cairo was reached early in 1900. On only two occasions was Mr Grogan compelled to take life, both times in self-defense.

NANSEN'S "FARTHEST NORTH" ECLIPSED

The young Duke of Abruzzi, Prince Luigi Amadeo of Savoy-Aosta, son of that Amadeo who for two turbulent years, 1871–'73, was called the King of Spain, and a nephew of the late King Humbert, has eclipsed Nansen's "Farthest North." Nansen reached latitude 86° 14′, the Duke of Abruzzi 86° 33′, while Lockwood (Greely expedition) gained 83° 24′, which is still the most northern land ever reached by man. The Duke of Abruzzi came within 239.15 statute miles of the Pole, Nansen 261 miles, and the Greely expedition 456.50 miles. The Italian prince is the first of the Latin race to cross the Arctic Circle since the days when another Latin, Gaspar Corte Real of Portugal, in 1500, discovered Hudson Strait and entered it never to return.

The *Stella Polare*, a vessel modeled after the plans of the *Fram*, but smaller and less stockily built, sailed from Christiania June 12, 1899, carrying the Duke of Abruzzi and some twenty officers and crew. It is stated that half a million dollars had been lavished on the equipment (see NAT. GEOG. MAG., vol. x, p. 362). In latitude 82° the ship was forced by the ice in Table Bay on to the land. One side had been crushed in, the hold had filled with water, and all attempts to staunch the leak had been futile. A single tent, constructed from the two which the party had brought with them, was pitched upon the land and a heavy sail laid over it and fastened down with planks taken from the ship. Several stoves were set up inside the tent; but though they were kept

CAPTAIN UMBERTO CAGNI

Leader of the party which reached latitude 86° 33′ north

at red heat during the whole of the first night there were 17 degrees of frost inside, and even the men's boots were frozen. After the first terrible night, however, they succeeded in keeping tolerably warm and comfortable. The tent was quite high, 18 feet, but as winter passed the roof bent more and more under the weight of snow and ice until it sometimes seemed as if it must yield to the strain.

In the early spring the exploring parties commenced work. Four expeditions were sent out. The first started northward to establish depots of supplies at regular intervals for the main party which was to follow. They were successful and returned after an absence of a few days. The second party, consisting of a Norwegian machinist and two Italians, never returned. These three men were the only ones lost during the year. The third expedition was gone 24 days, and the fourth 104 days. It was this fourth expedition which reached latitude 86° 33′.

The Duke of Abruzzi had originally hoped to lead the advance, but the loss of two fingers from the frost compelled him to remain by the ship when the main party started, February 28, 1900. Their first attempt to advance was checked by violent storms. which drove them back to shelter. A few days later, March 11, they again started, the party including Captain Cagni, who is known in America as one of the companions of the Duke of Abruzzi in his ascent of Mt St Elias; M. Cueders, two Alpine climbers, and one other Italian. On their way northward they visited a hut built by Dr Nansen in Franz Josef Land. Cairns were built by them to commemorate the three men who had perished. On gaining latitude 86° 33′, satisfied with having advanced 21 miles further than Nansen, Captain Cagni turned back and reached his ship the third week in June. By patience and hard work the *Stella Polare* had been patched up and rendered seaworthy by the time the ice broke up sufficiently to allow them to escape. It is too soon to learn the scientific results of the year of exploration, but apparently these were quite satisfactory.

A cablegram from London states that Dr Nansen and the Duke of Abruzzi have formed a partnership and will soon undertake a joint expedition to the North Pole.

GEOGRAPHIC NOTES

Dr Matignon, the physician of the French legation at Pekin, has published a book entitled *Superstition, Crime, and Misery in China*, which contains a fund of facts about the lowest strata of Chinese society. He estimates that there are in Pekin one hundred thousand beggars, one-sixth of the population of the city. They are all members of one society, with a perfect organization. Their president, by election, is called the King of Beggars, and has absolute authority over all, even to life and death, nor does the government ever question his power over all beggars. The chief beggar divides the city into sections, which are assigned to different sub-chiefs. Each leader sees that his section is carefully exploited, and at nightfall hands his receipts to the common treasury. The shops are graded, and each must pay a proportionate tax. If the shopkeeper refuses to grant the extortion, the beggar

silently departs, but soon returns with several companions and with increased demands. A fire that night and a total loss of stock and building follow a persistent refusal. To escape the polite, daily persistence of these rogues, shopkeepers often pay yearly tribute to the King, who promises and gives them his protection from such annoyance. Beggars rarely trouble private houses, except at times of funerals or weddings, and then their absence may be purchased. They find a lodging where they may. The bed of many is the middle of the street and their coverlet the dust of the road, which they throw over their bodies before falling to sleep. Winter frosts and pests ravage their ranks. In the summer of 1895, when the cholera raged in Pekin, 50,000 beggars perished. During the winter and spring which followed they seemed to have vanished from the streets, so terrible had been the devastation of death among them.

It now appears that Borchgrevink's South Polar expedition did not reach the South Magnetic Pole in the Antarctic winter of 1899, contrary to the first published reports. The party calculated the position of the magnetic pole, but their attempts to reach it by sled proved unsuccessful. They found the ice quite different from that of Greenland. In Victoria Land enormous glaciers varying in height from 5,000 to 14,000 feet barred advance by sled. Captain Borchgrevink therefore, after several futile efforts to push overland from Cape Adare, sailed on into Ross Bay until latitude 78° 35′ was reached. Here he took to sled again and managed to advance to 78° 50′, the nearest approach to the South Pole yet made. He agrees with the scientists of the Belgian Antarctic expedition of the preceding year, which, it will be remembered, was the first to pass a winter within the Antarctic Circle, that the winter is much harsher in south polar than in north polar regions.

The great tide of German emigration has ceased, judging from the figures of the number of Germans emigrating during the last two years. In 1899, 23,740 Germans sailed from Hamburg, Bremen, and other ports to settle in a foreign land; during the preceding year, there were 1,500 less. Of these, about 19,000 were bound for the United States, 1,976 for Central and South America, and 548 for Africa. It is only a few years since more than 200,000 Germans were leaving Germany each year.

The Rockies of Canada. By Walter Dwight Wilcox. With 44 illustrations, including 25 photogravures and 17 half-tones, and 3 maps. Large 8vo, pp. ix + 309. New York and London: G. P. Putnam's Sons.

Mr Wilcox is a gentleman of means, who devotes his leisure time and much of his income to travel in out-of-the-way places and to exploration. He is a surveyor, something of a naturalist, a pleasing writer, and a most artistic photographer, and therefore he is able to share with others the fruits of his travels. The present work, which is in part a second edition of his "*Camping in the Canadian Rockies*," is composed mainly of a narrative of his explorations in this "Switzerland of America." It closes with chapters on mountaineering, hunting, and fishing, and the Stony Indians. The region he describes is in the highest, most rugged and icy of Canada's portion of the Rocky Mountain system—a region well worthy the attention of Swiss Alpine climbers when seeking for new mountains to conquer.

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY, SESSION 1899–1900

Special Meeting, November 3, 1899.—Vice-President McGee in the chair. Hon. John W. Foster, ex Secretary of State, gave an illustrated lecture on the Alaskan Boundary.

Regular Meeting, November 10, 1899.—Vice-President McGee in the chair. Prof. A. J. Henry, of the U. S. Weather Bureau, gave an illustrated lecture on the Variations of Lake Levels.

Special Meeting, November 17, 1899.—President Bell in the chair. Mr Walter Wellman gave an illustrated lecture on his Arctic Explorations of 1898–1899.

Regular Meeting, November 24, 1899.—Vice-President McGee in the chair. Mr J. B. Hatcher, of the Carnegie Museum, Pittsburg, Pa., gave an illustrated lecture on Explorations in Patagonia.

Special Meeting, December 1, 1899.—Vice-President McGee in the chair. Prof. G. K. Gilbert, of the U. S. Geological Survey, gave an illustrated lecture on the Glaciers of Alaska and the Harriman Alaskan Expedition.

Regular Meeting, December 8, 1899.—Vice-President McGee in the chair. Hon. John Barrett, ex-Minister to Siam, gave an illustrated lecture on the Philippine Islands and Their Environment.

Special Meeting, December 15, 1899.—Vice-President McGee in the chair. Hon. Dean C. Worcester, of the Philippine Commission, gave an illustrated lecture on the Filipinos.

Regular Meeting, December 22, 1899.—Vice-President McGee in the chair. Mr F. H. Newell, Hydrographer of the U. S. Geological Survey, gave an illustrated lecture on Gila River, Arizona, and its Irrigation Possibilities through Water-storage.

Regular Meeting, January 5, 1900.—President Bell in the chair. Col. F. F. Hilder, of the Bureau of American Ethnology, gave an illustrated lecture on British South Africa and the Transvaal.

Special Meeting, January 12, 1900.—Vice-President McGee in the chair. Mr Edwin V. Morgan, Secretary to the Samoan Commission, gave an illustrated lecture on the Samoan Islands.

Regular Meeting, January 19, 1900.—President Bell in the chair. Mr N. H. Darton, of the U. S. Geological Survey, gave an illustrated lecture on the Black Hills of South Dakota.

Special Meeting, January 26, 1900.—President Bell in the chair. Hon. Dean C. Worcester, of the Philippine Commission, gave an illustrated lecture on the More Civilized Filipinos.

Regular Meeting, February 2, 1900.—President Bell in the chair. Dr Frank Russell, of Harvard University, gave an illustrated lecture on Explorations around the Arctic Circle.

Special Meeting, February 9, 1900.—Vice-President McGee in the chair. Mr Wm. Barclay Parsons, C. E., gave an illustrated lecture on Explorations along the Yangtze.

Regular Meeting, February 16, 1900.—Vice-President McGee in the chair. Dr Geo. M. Sternberg, Surgeon-General U. S. Army, gave an illustrated lecture on the History and Geographic distribution of Bubonic Plague.

Special Meeting, February 23, 1900.—President Bell in the chair. Hon. William E. Curtis gave an illustrated lecture on the Road to Bolivia.

Regular Meeting, March 2, 1900.—President Bell in the chair. Prof. John M. Coulter, of Chicago University, gave a lecture on the Geographic Distribution of Seed Plants.

Lenten Course, March 6, 1900.—President Bell in the chair. Prof. J. Howard Gore, of Columbian University, gave an illustrated lecture on the Growth of the Netherlands.

Special Meeting, March 9, 1900.—President Bell in the chair. Rev. T. S. Wynkoop gave an illustrated lecture on Social and Economic Conditions in India.

Lenten Course, March 13, 1900.—Vice-President McGee in the chair. Prof. Jean C. Bracq, of Vassar College, gave a lecture on the Growth of France.

Regular Meeting, March 16, 1900.—Vice-President McGee in the chair. Mr Montagu White, former Consul-General of the Transvaal at London, gave a lecture on South Africa—the Country, People, and Problems.

Lenten Course, March 21, 1900.—Vice-President McGee in the chair. Prof. William Z. Ripley, of the Massachusetts Institute of Technology, gave an illustrated lecture on the Growth of Austria-Hungary.

Special Meeting, March 23, 1900.—Vice-President McGee in the chair. Mr Marcus Baker, Geographer to the Paris Arbitration Committee, gave an illustrated lecture on the Venezuelan Boundary.

Lenten Course, March 27, 1900.—President Bell in the chair. Prof. John L. Ewell, of Howard University, gave an illustrated lecture on the Growth of Germany.

Regular Meeting, March 30, 1900.—President Bell in the chair. Prof. William Morris Davis, of Harvard University, gave an illustrated lecture on the Waste of the Land on its Way to the Sea.

Lenten Course, April 3, 1900.—Vice-President McGee in the chair. Dr Edwin D. Mead, editor of the *New England Magazine*, gave a lecture on the Growth of England.

Special Meeting, April 6, 1900.—Vice-President McGee in the chair. Commander Chapman C. Todd, U. S. Navy, gave an illustrated lecture on a Voyage up the Amazon River to Yquitos, Peru.

Lenten Course, April 10, 1900.—President Bell in the chair. Prof. Edwin A. Grosvenor, of Amherst College, gave an illustrated lecture on the Growth of Russia.

Regular Meeting, April 13, 1900.—President Bell in the chair. Mr Gerard H. Matthes, of the U. S. Geological Survey, gave an illustrated lecture on the Dykes of Holland.

Special Meeting, April 27, 1900.—Vice-President McGee in the chair. Dr H. C. Frankenfield, of the U. S. Weather Bureau, gave an illustrated lecture on the Floods of the Mississippi.

Annual Excursion and Field Meeting, May 27–29, 1900.—An excursion was made by 250 members and friends to Norfolk, Va., by the special steamer *Newport News*, leaving Washington at 5 p. m. Sunday, May 27, and returning early Tuesday morning, May 29. The total eclipse of the sun, on May 28, was observed at Norfolk. Newport News, Yorktown, and Fortress Monroe were also visited.

Recommendation for Membership in the National Geographic Society

The following form is enclosed for use in the nomination of persons for membership. *Please detach and fill in blanks and send to the Secretary.*

DUES: Resident, $5; Non-resident, $2; Life membership, $50. If check be enclosed, please make it payable to order of the National Geographic Society, and, if at a distance from Washington, remit by New York draft or P. O. money-order.

.....*1900*

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